CBRN Escape Respirators

Chemical Warfare Agent Testing

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CWA Testing Conducted at Edgewood Chemical Biological Center (ECBC) in Support of Escape Hood Projects

- **Escape Hoods for Select Federal Agencies – 1985**
- **Technical Support Working Group (TSWG) Escape Hood– 2000-Present**
- **Joint Service Chemical Environment Survivability Mask – 2001- Present**
- **NIOSH Baseline Testing for Escape Hoods - 2003**

CWA System Testing

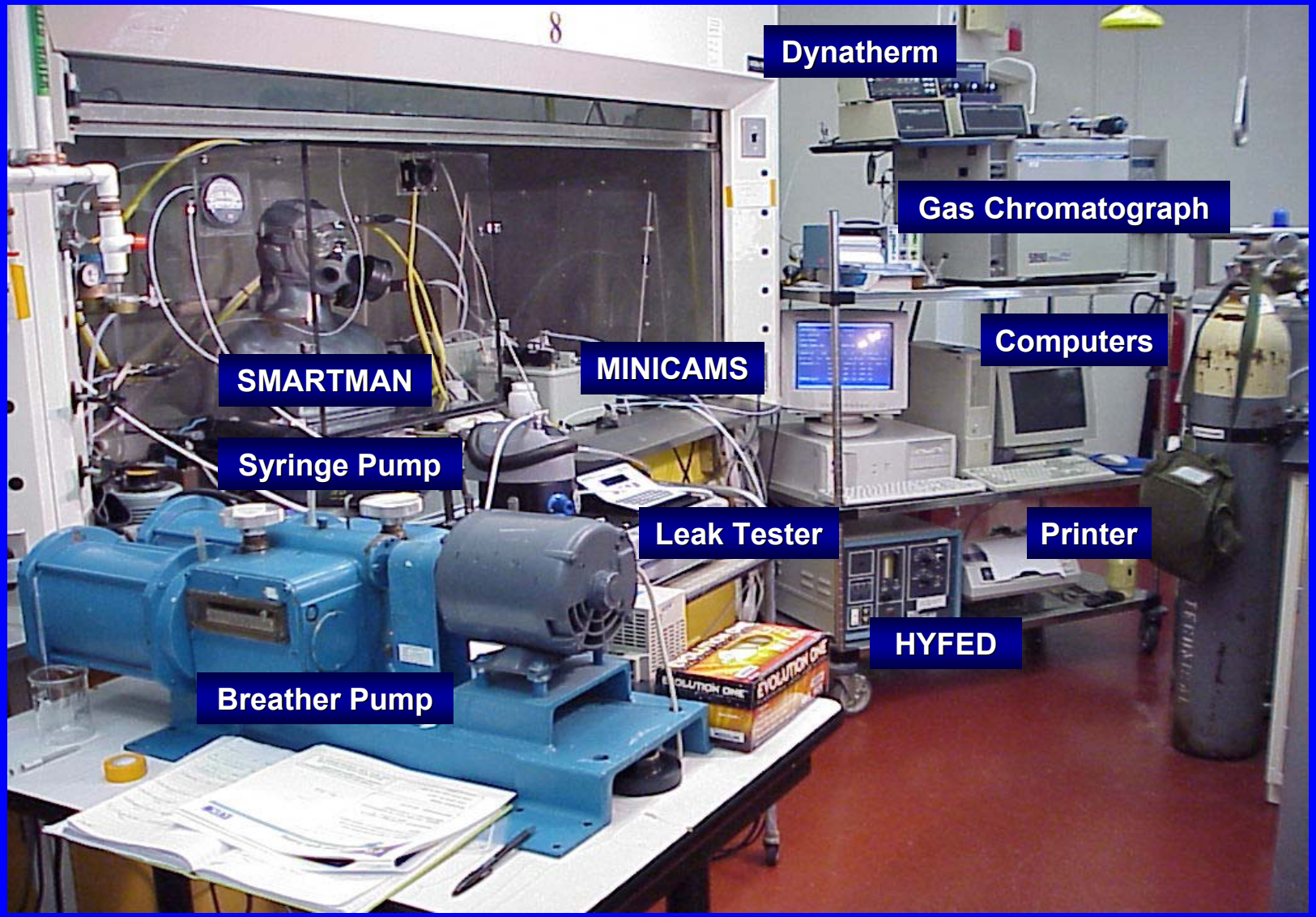
SMARTMAN System (SiMulant Agent Resistant Test MANikin)

A headform system used to evaluate Chemical Warfare Agent penetration and permeation effects on respirators under simulated breathing conditions with "perfect" respirator sealing to the SMARTMAN.

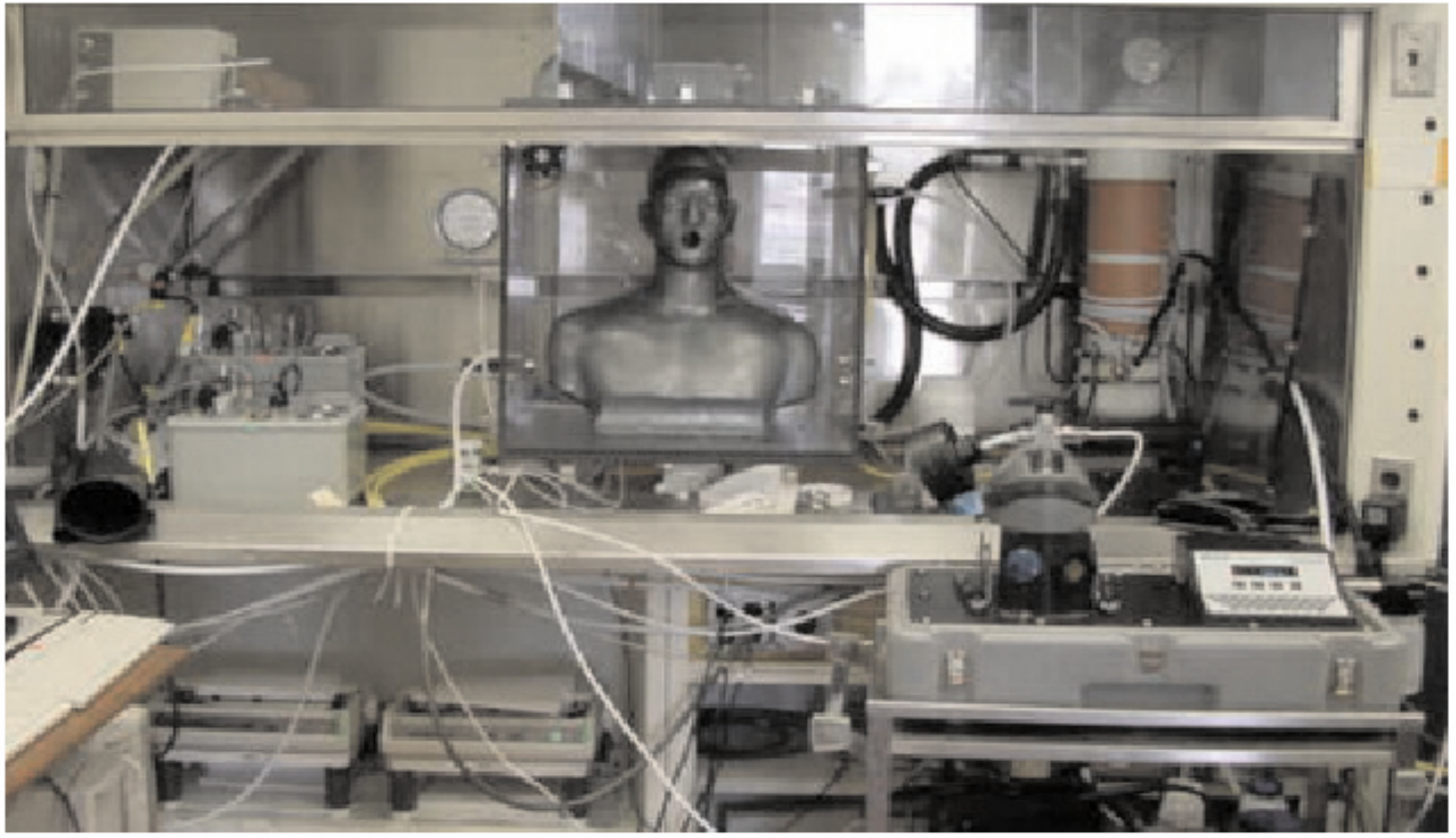
SMARTMAN Equipment

- Syringe pump to generate agent vapors
- Air Controller
- Breather Pump, Sinusoidal
- Mixing Chamber
- MINICAMS or Gas Chromatograph - Dynatherm
- HYFED (Hydrogen Flame Emission Detector)
- Miran Detectors
- Computer

Equipment Setup



Equipment Setup



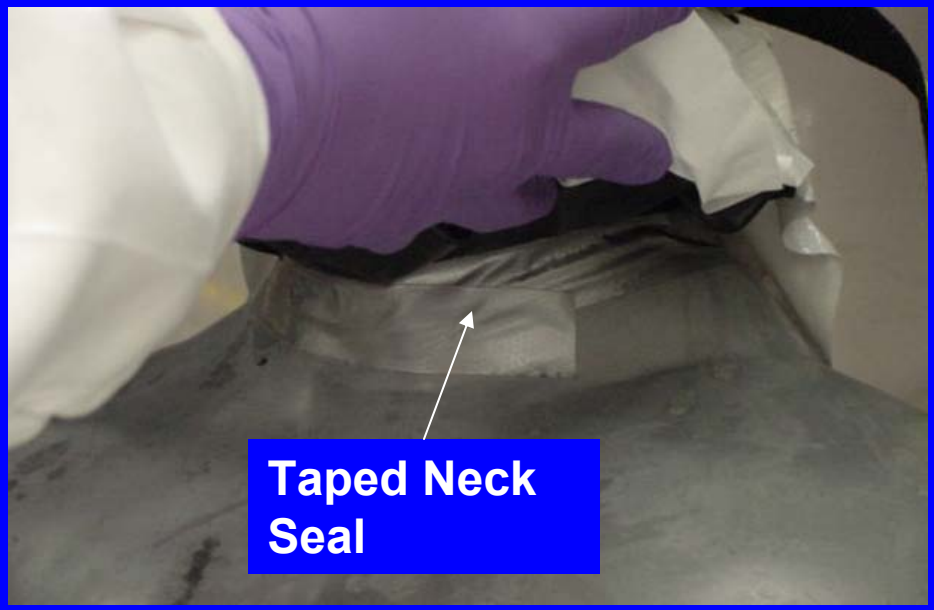
Test Method Development & Validation

- Established test procedures
- Develop test protocol
- Validate test method/procedures for specific protocol
- Document as a Standard Test Procedure

Approved and Validated Test Methods for SCBA and APR

Escape Hood Testing Changes

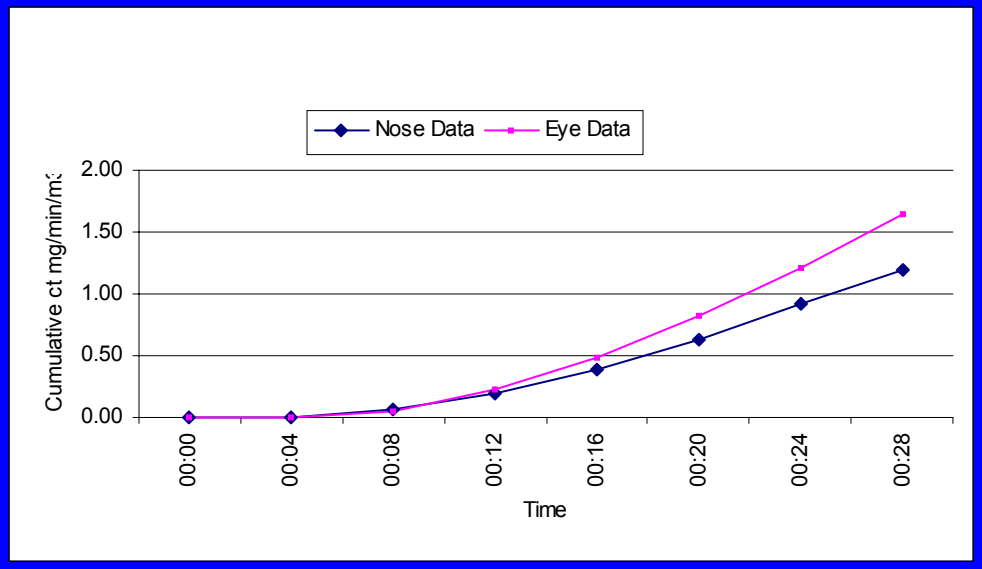
- Neck seal is taped to obtain a “leak tight” SMARTMAN to hood interface. Seal verified with a TDA-99 particle leak tester.
- TDA-99 Test accomplished on agent test SMARTMAN

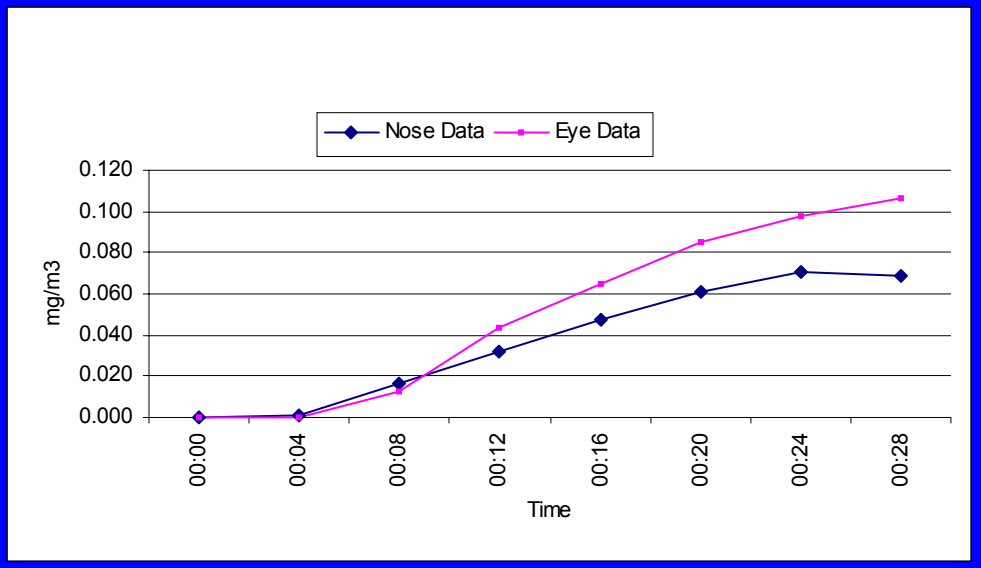


Escape Hood CWA Baseline Data

- Commercial Escape Hoods were obtained and tested to determine potential CWA capabilities
- SCBA CBRNE Test Parameters Used
  - Sarin (GB) Challenge: 2000 mg/m3 for 30 minutes
  - Mustard (HD) Challenge: 300 mg/m3 for 30 minutes and liquid HD on the hood system at 10 grams/m2
  - Breather flow rate of 40 liters/minute
- Considered worse case scenario

GB Sample Data





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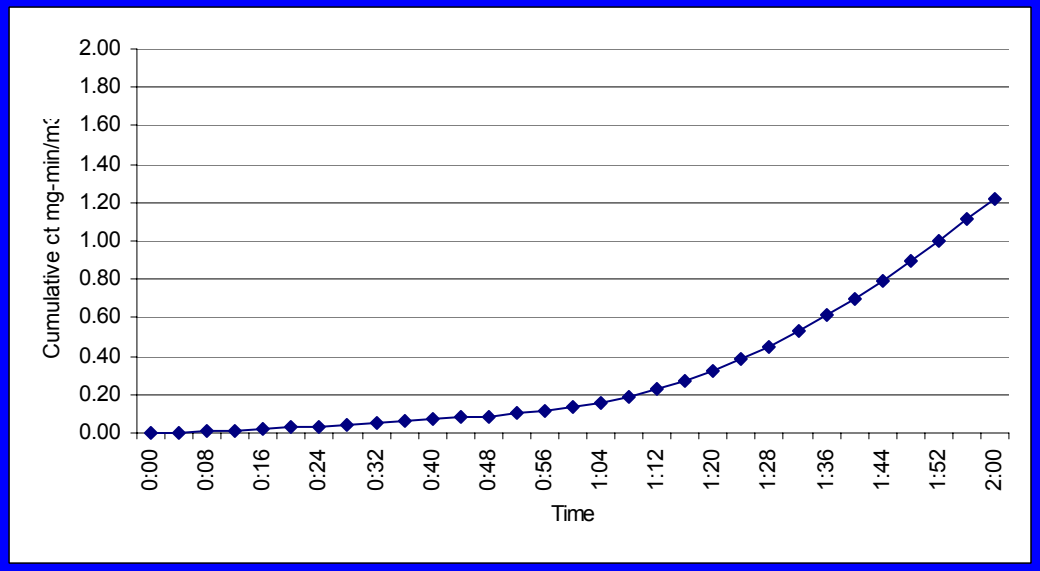
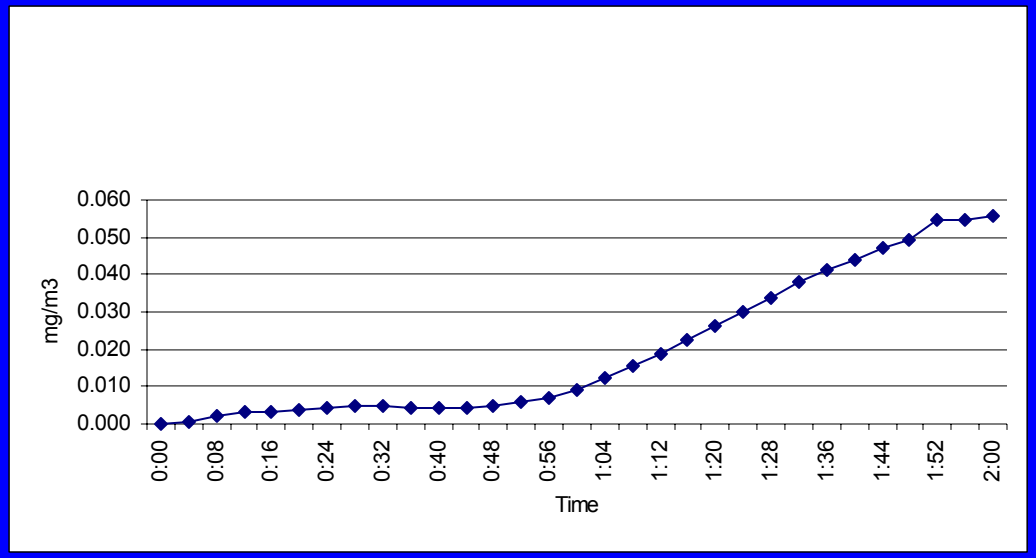
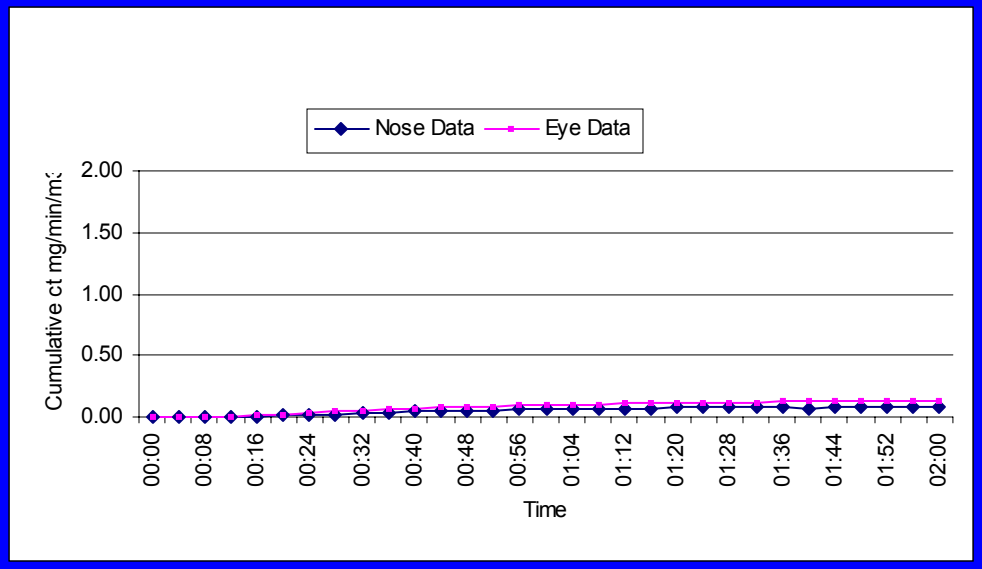
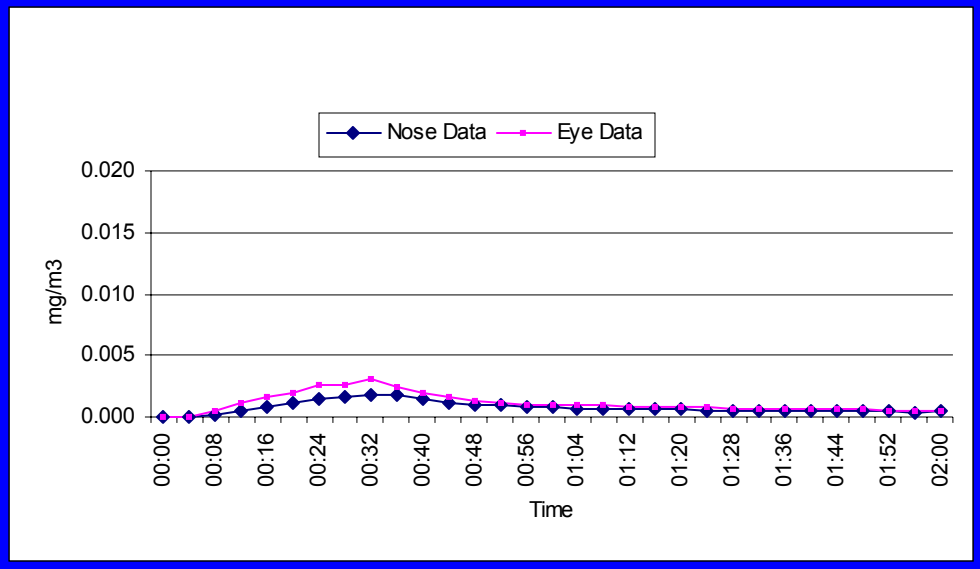


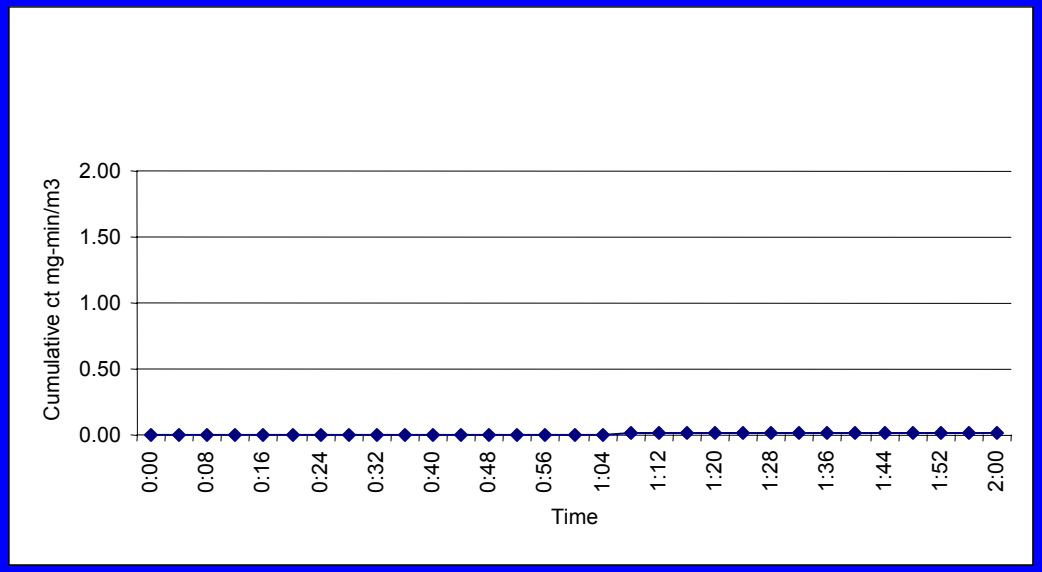


Sample GB Data

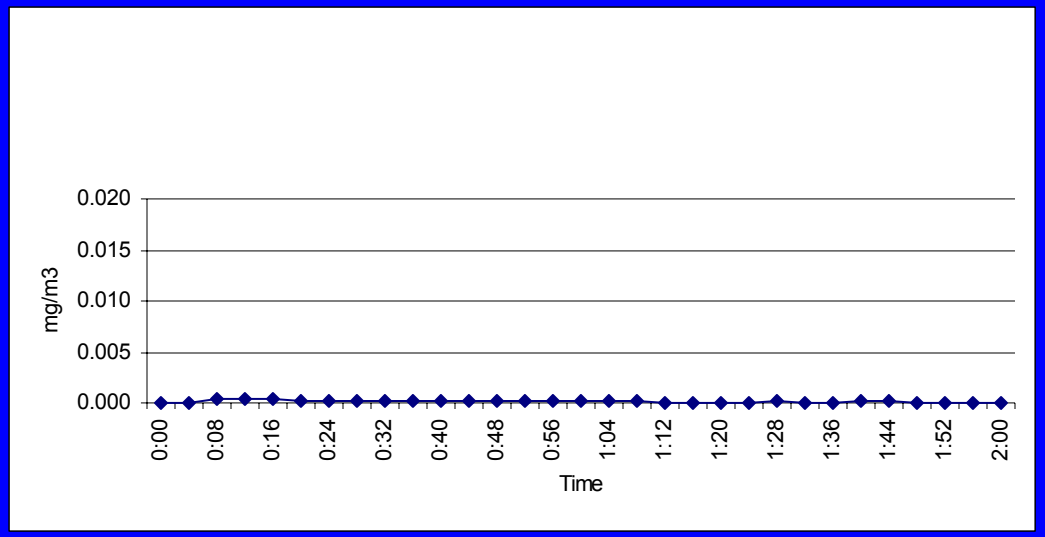




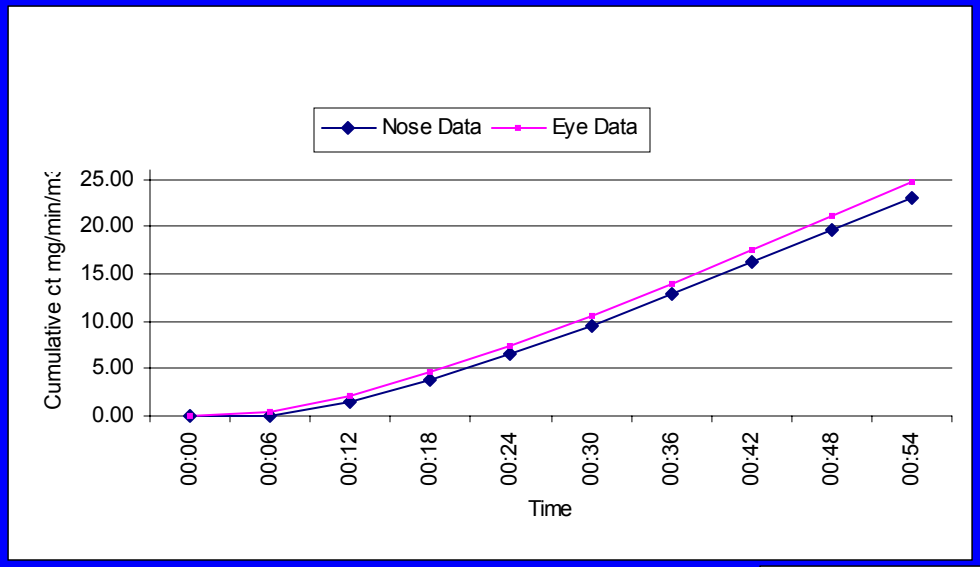
Sample GB Data

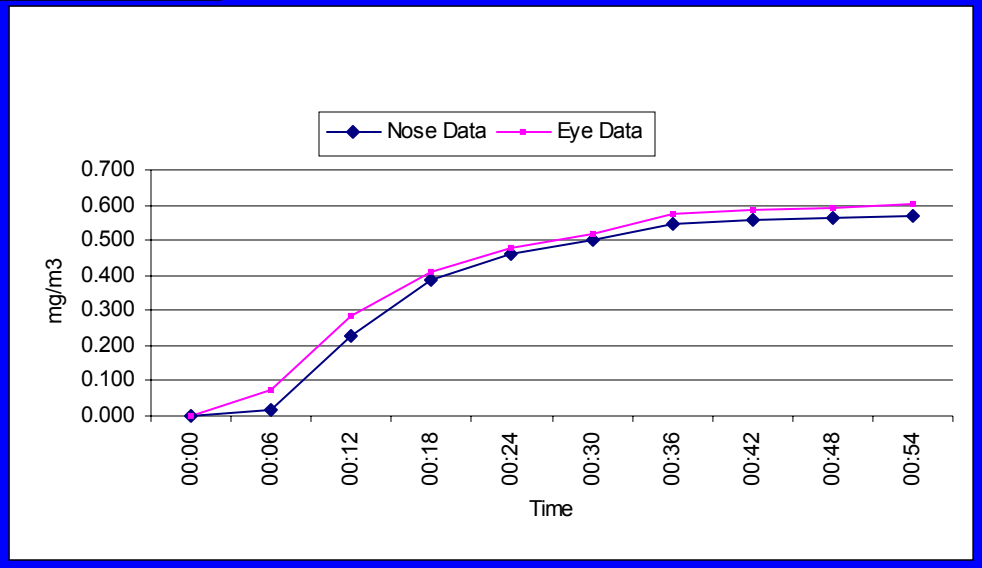


Two Samples Showed "Baseline" Results



Sample HD Data





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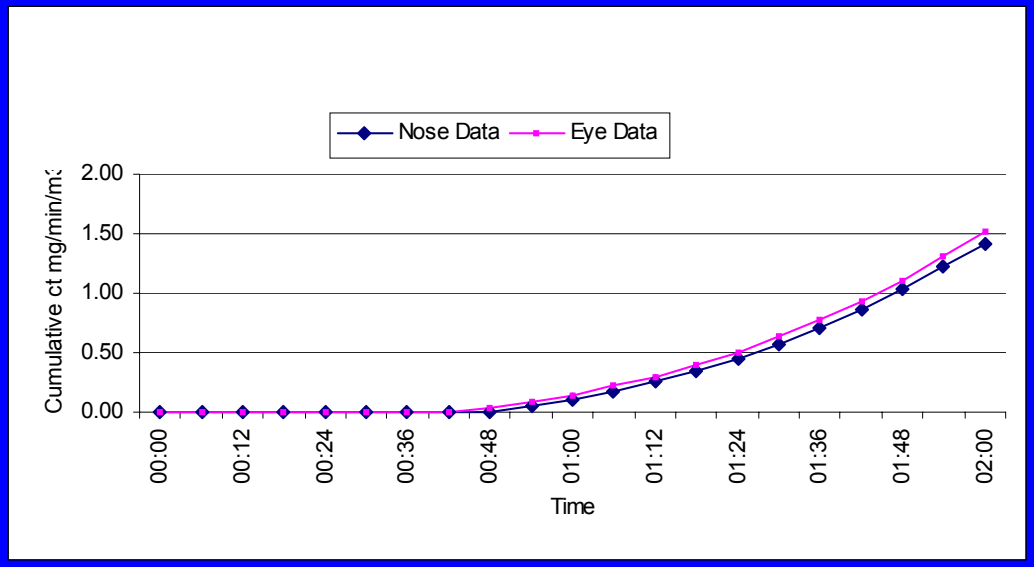

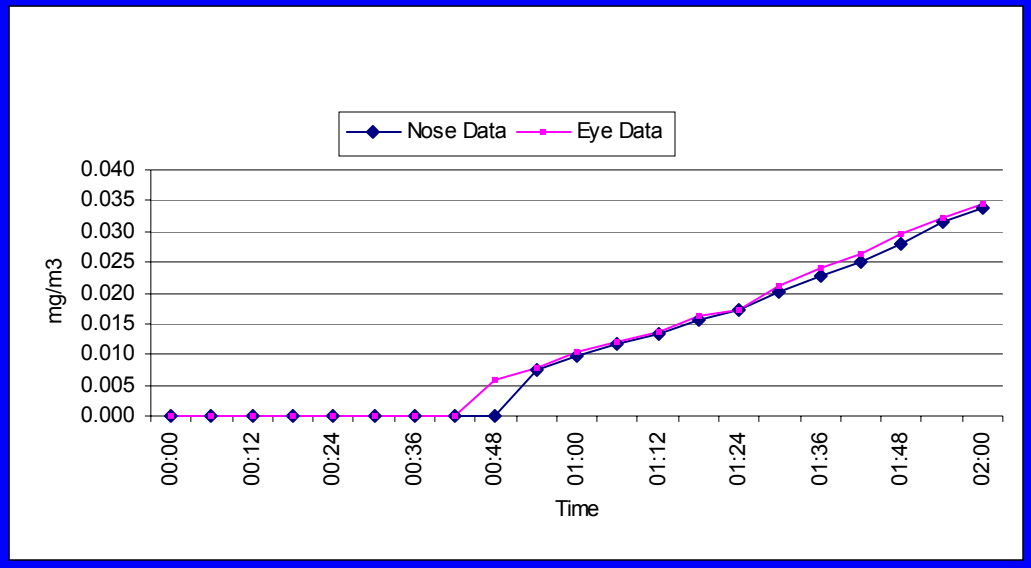

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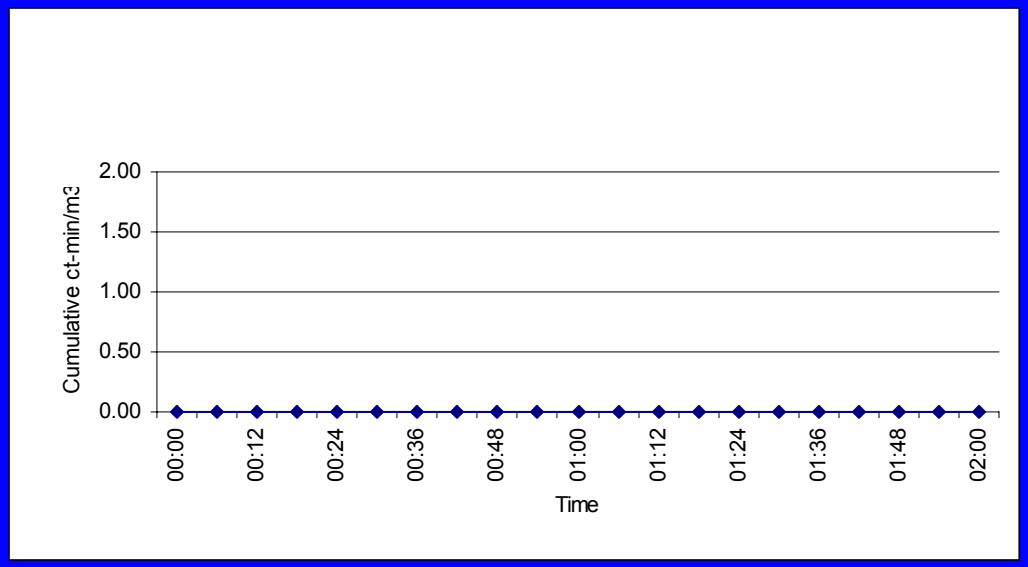
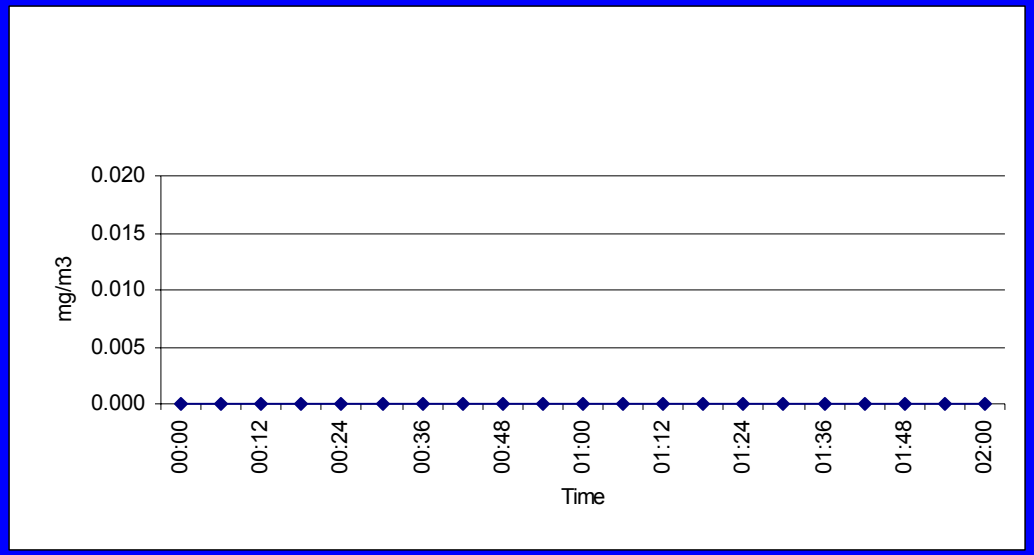


Three Samples Showed "Baseline" Results



Lessons Learned

- **Other Tests Can Significantly Impact CWA Results**
  - **High temperature Storage**
  - **Packaged Rough handling**
- **Materials and Methods of Construction – Soft Material to Hard Material Interfaces**

Summary of Results

- **Escape Hoods Are Capable of High Level CWA Protection**